

# NASA Facts

National Aeronautics and Space Administration  
Goddard Space Flight Center  
Wallops Flight Facility  
Wallops Island, VA 23337  
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## Space Experiment Module (SEM)

The Space Experiment Module (SEM) Program (<http://www.nasa.gov/sem>) is an education initiative sponsored by the National Aeronautic and Space Administration NASA Shuttle Small Payloads Project. The Program provides nationwide educational access to space for kindergarten through university level students. The SEM program focuses on the science of zero-gravity and microgravity. Within the program, NASA provides free small containers or “modules” for students to fly experiments on the Space Shuttle. The experiments are created, designed, built, and implemented by students with teacher and/or mentor guidance. Student experiment modules are flown in a “carrier” which resides in the cargo bay of the Space Shuttle. The carrier supplies power to, and the means to control and collect data from each experiment.

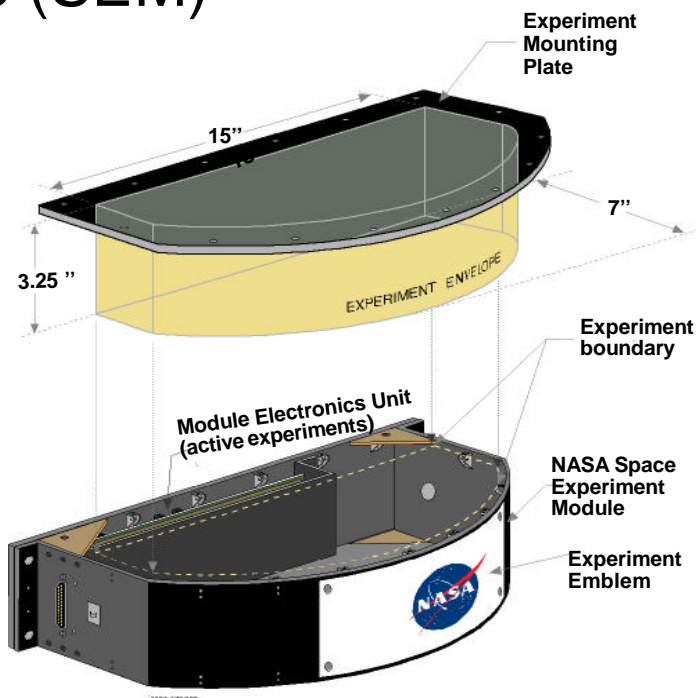
### Overview

The (SEM) Carrier System is a self-contained assembly of engineered subsystems that function together to provide structural support, power, experiment command and data storage capabilities. The carrier system is a five cubic foot “canister” containing ten experiment modules.

The small, enclosed module can contain approximately 300 cubic inches (4.9 liter) of experiment apparatus weighing up to 6 pounds (2.7 Kilogram). Experiments may be active (uses carrier supplier power) or passive (non powered). Students may design active experiment ‘on paper’ using NASA supplied software and database. Passive experiments are generally packed in NASA-provided “Space Capsules.” Experiment design must adhere to safety standards.

The Space Capsules used to contain passive test articles are clear, sealable polycarbonate vials, one inch in diameter and three inches in depth. Space Capsules are packed in special foam layers during integration.

The active experiment container uses the “Module Cover” as the Experiment Mounting Plate. The free



space available for experiment apparatus in the Module experiment compartment is the “Experiment Envelope”. The Envelope is a precisely defined volume outlined on the inboard surface of the Experiment Mounting Plate and extends 3.25 inches

software required for active experimentation is accessible through the Web. The software application helps the experimenter describe the experiment; enter power consumption, parts, material, and timeline; and control and command data. The software may be used to analyze the data for SEM compatibility and “post-flight” reports.

The active modules are powered by one 12-Volt battery independent of the Shuttle power supply. Each powered module has an integrated programmable control circuit board or “Module Electronic Unit” (MEU) for data sampling and storage. The MEU processes the student-devised flight operations timeline. A “Ground Module Electronic Unit” is provided to selected active experimenters for development and testing of their active experiment.

Experiments selected to participate will receive a hardware package to support the construction and development of the selected experiment. The hardware package contents are determined by the proposed experiment design.

Experiments are required to be shipped to NASA approximately four months prior to the scheduled flight. The SEM canister is generally installed three months prior to launch in the Space Shuttle cargo bay.

During the early stage of the Shuttle flight, astronauts activate the SEM canister via the Payload and General Support Computer. For active experiments the MEU's carry out their unique programmed timeline defined by the experimenter's.

Participation in flight integration and post-flight de-integration is conditional and coordinated through the program. Students and teachers are invited at their expense to attend the launch at Kennedy Space Center.

Following Shuttle spaceflight of the SEM carrier, the experiment hardware or space capsules and the active inflight data from MEU's are returned to the student experimenters. Experimenters are requested to provide NASA a copy of their post-flight data analysis and reports.

Experimenter groups are awarded a "Flight Certificate" which includes a SEM sticker flown on the Shuttle Mission.

### **SEM Flight History and Projected Schedules**

A variety of SEM experiments have flown on Shuttle missions since 1996. Students of all ages have enjoyed the experience of exploring the space environment.

SEM-01 Space Shuttle-80 -- Columbia  
Launch date: November 19, 1996

SEM-02 Space Shuttle 85 -- Discovery  
Launch date: August 7, 1997

SEM-03 Space Shuttle 91 -- Discovery  
Launch date: June 2, 1998

SEM-04 Space Shuttle 95 -- Discovery  
Launch date: October 29, 1998

SEM-05 Space Shuttle 91 -- Discovery  
Launch date: June 2, 1998

SEM-06 Space Shuttle 101 -- Atlantis  
Launch date: May 19, 2000

SEM-07 Space Shuttle 88 -- Endeavor  
Launch date: December 4, 1998

SEM 08 Space Shuttle 106 -- Atlantis  
Launch Date: September 15, 2000

SEM 09 Space Shuttle 102 -- Discovery  
**Scheduled for Launch February 2001**

SEM 10 Space Shuttle 105 -- Endeavour  
**Scheduled for Launch June 2001**

SEM 11 Space Shuttle 108 -- Endeavour  
**Scheduled for Launch October 2001**

For more information on experiment names and types, that have flown or are scheduled to fly, view the SEM Hall of Fame:

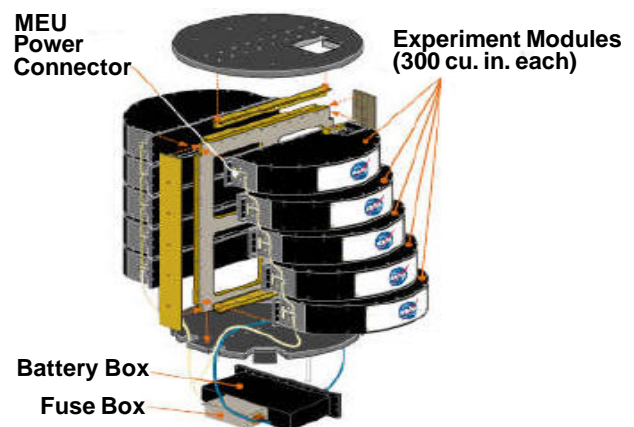
<http://www.wff.nasa.gov/sem/history/history.html>

### **Getting Started**

Submitting a proposal for a SEM experiment offers students an excellent opportunity to explore space and interact with the Space Shuttle program. Instruction for submitting an application can be found in the "How To Participate" section at:

<http://www.wff.nasa.gov/sem/history/index.html>

### **SEM Support Structure**



The SEM Support Structure is the structural backbone of the SEM subsystems housed within the GAS canister. It serves as the mounting frame for the Power Subsystem components and ten modules.

Applications for participation in the SEM program are accepted on a continuous basis. For additional information or questions, please contact the following:

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For written correspondence, send your request to:

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